PATENT SPECIFICATION

Application: Aug. 2, 1927. No. 20,386/27. 284[illegible]11

(Patent of Addition to No. 275,557. Convention Date (Belgium): Aug. 4, 1926.)

Complete Accepted: Feb. 9, 1928.

COMPLETE SPECIFICATION.

Improvements in or relating to Rotary Valves, particularly for Internal Combustion Engines.

I, CHARLES LUYCKX, of 83, rue du Canal, Louvain, Belgium, a subject of the King of the Belgians, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to improvements in or modifications of the rotary valve claimed in Specification No. 275,557.

The regulation of the phases of the distribution produced by the valve can be effected, in the well known manner, by a simple angular displacement of the cylindrical rotary valve body with respect to the position of the pistons in the cylinders of the engine.

Such a displacement permits, as a matter of fact, to influence, that is, to advance or to delay, the beginning of the admission and of the exhaust stages, but this entails necessarily a similar advance or delay for the end of these stages. It is therefore not possible to effect a suitable regulation for all the performances of the engine, which would be nevertheless highly desirable for automobile and like engines, the speed of rotation of which must be able to vary between very wide limits. Besides, the operation can only be effected while the engine is stopped.

According to the present invention, a supplementary regulation of the distribution can be effected at any time, even while the engine is working, either manually or by the action of a regulator affected by the speed of the said engine, in such a manner that the stages are aways suited to the actual speed of the engine, by displacing angularly, by means of a suitable control, the central body of the valve, which body was hitherto fixed, the said body being specially constructed and suitably mounted in the fixed external body, so as to be movable for this purpose. The said control is constructed so that it can be operated from a distance by the driver of the motor vehicle, or by a regulator affected by the speed of the engine particularly when it is a question of an engine for a vehicle, boat, aeroplane, etc.

By displacing in this manner the central body backwards, that is, in the direction opposite to that of rotation of the valve cylinder, a corresponding advance is obtained for the closure of the admission and exhaust passages. By displacing the same body forward, that is, in the direction of the rotation of the valve cylinder, a corresponding delay is obtained for the opening of the admission and exhaust passages.

By combining this displacement of the central body, which is variable at will, with each adjustment of the rotary valve, a better and more thorough regulation of the stages of the distribution may evidently be obtained, this regulation being effected at the works by the manufacturer, or, while the engine is running, by the driver.

As an illustration, simply, a particular manner of carrying out the invention, permitting the displacement of the central body, is shown diagrammatically in the appended drawings, in which:—

Fig. 1 represents a view of the valve in transverse section through the admission passage, the movable central body being shown in a position displaced in a direction opposite to that of rotation of the rotating body;

Fig. 2 similarly represents a view in section at the exhaust passages.

Fig. 3 is a view, in longitudinal section, usually, of the end of the valve, on the side of the regulation control.

Fig. 4 is a view in elevation, end on, showing the manner of controlling the movable central body.

On these figures:

a_1, a_2 are the external fixed body of the valve; l is the rotatory valve cylinder, i is the central body, which is movable.

Admission passages b_1, b_2 diametrally opposite to each other, similarly as exhaust passages c_1, c_2, are provided in the fixed body a_1, a_2.

Diametral passages j and k are provided for admission and exhaust respectively, in the movable central body i.

Ports m_2, n_2, diametrally opposite to each other, are provided for admission

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in the valve cylinder l; similarly, ports m_0, n_0 are provided for the exhaust. A water circulation is provided longitudinally inside the said central body.

The central body of the valve presents externally a collar i_1 in which are provided circular slots such as i_2 in which pass bolts y screwed in the end a_2 of the fixed body. The collar i_1 is maintained in frictional contact against the end a_1 by a disc z through which pass the bolts y and submitted to the pressure of springs such as y_1, which pressure may be adjusted at will by nuts y_2.

On the periphery of the collar i_1 is fixed a sector v with teeth v_1 in which engage the teeth u_1 of a sector u pivoted about an axis x and adapted to be actuated from a distance, by the driver by means of a rod 26 connected to the arm u_2.

It will be understood that the sector v could equally well have helicoidal teeth, engaged by a worm on a spindle operated by the driver.

The advantages of the supplementary regulation by displacement of the central body i will be better understood by considering a concrete example:

It will be supposed that, according to normal distribution, admission begins at 0° and ends 40° after the lower dead centre of the piston, while the opening to exhaust takes place 40° before the lower dead centre of the piston, and that it closes at 0°, that is to say, at the upper dead centre of the piston.

By examining the effect of regulating by angular displacement of the rotary valve about its mean position, the following conclusions are arrived at.

If, by displacement of the rotary valve, opening to admission is delayed 10°, there will be a delay of closure to admission of 40+10 or 50°. Such a delay of the end of the admission would be excessive at small speeds and could only be suitable for high performances.

To this delay of 10° for opening to admission will correspond a delay of 10° for the opening to exhaust. The exhaust will therefore open 30° before the lower dead centre of the piston, an amount which would only be acceptable at small speeds.

Moreover, the closure to exhaust will only take place 10° after the upper dead centre of the piston, which is excessive.

It is easy to see that analogous drawbacks would result from a displacement of the valve in the opposite direction for giving a lead to all the stages of the distribution.

By advancing or retarding the beginning of one of the stages, all the stages will be necessarily affected, and if the result obtained is the most favourable for one or for some, it is definitely unfavourable for all the others, for a given engine performance.

The angular displacement of the rotary valve permits therefore to obtain an average regulation which is suitable for an average performance of the engine but which is not at all suitable when the speed of the engine is decidly lower or decidedly higher than this mean performance.

For motor vehicles, the speed of which must be capable of varying between very wide limits, the method of regulation described above is therefore most insufficient.

The supplementary regulation, provided according to the invention, by the displacement at will of the central body of the valve, permits of adjusting the regulation of the distribution of each kind of performance of the engine between the extreme limits of its speed of rotation.

It is to be noticed that an angular displacement of the said central body influences the position of one only of the edges of the passages provided in this body with respect to the passages provided in the external fixed body of the valve. The other edge of the passages of the said central body is, in fact, constituted by the wall of the external fixed body.

The displacement of the central body under consideration permits in this way to act only on the beginning or on the end of the stages of the motor cycle, according to the direction in which this displacement is operated.

For delaying 10° the beginning of the opening to admission, it will be therefore sufficient to displace angularly the central body through 2½° in the direction of the rotation of the valve cylinder, the latter rotating with one quarter of the speed of the crank shaft. The end of the closure to admission will remain unchanged.

In the case when it would be desirable, for a similar displacement of the central body, to obtain different effects on admission and on exhaust, it will suffice to provide, in this central body, admission and exhaust passages having different dimensions transversely of the said body.

In order to advance by 10° the closure to admission it will suffice to displace the central body through 2½° backwards, that is, in the direction opposite to the direction of rotation of the valve cylinder. The beginning of admission will then remain unchanged.

This same displacement does not modify the beginning of the opening to exhaust, but gives an advance of 10° to the closure to exhaust.

In order to avoid that this closure to exhaust should ever take place before the upper dead centre of the piston, which would cause a compression of the burnt gases in the cylinder, at the end of the fourth phase of the cycle, the closing edges of all the exhaust passages are, according to this invention, bevelled or turned back at k_1 (Fig. 2).

If the edge of the opening of the passages k are also turned back, the same effect will be obtained as if these passages had been given in a direction transverse to the central body, a greater size than that of the admission passages j.

It goes without saying that the displacement of the central body can be effected by the action of a suitable automatic governor, of known type, not shown, driven by the engine or influenced by the speed of the latter.

In the case when the casing of the valve (that is, the external fixed body) is constructed in two half pieces, as shown in Fig. 1 of the drawing appended to the principal patent, or in Fig. 4 of the present addition, the valve cylinder can be placed directly in the lower semi-cylindrical recess of the said fixed body, the upper portion of this fixed body being withdrawn. In such case, the valve cylinder can advantageously be provided with collars, not shown, which would fit in corresponding circular grooves cut into the walls of the fixed body, in order to obtain a better air-tightness.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An improvement in or modification of the rotatory slide valve, particularly adapted to internal combustion engines, as claimed in the parent specification, comprising a distributing cylinder adapted to turn in the bore of an external body provided with diametral passages, and round a central body, also provided with diametral passages, and mounted inside the external body constituting the valve casing, in such a way that the central body can be displaced angularly in both directions with respect to the said fixed external body, characterised in that the arrangement permits the advance or the retardation either of the beginning of the opening to admission, or to exhaust without changing the time of their closing, or the end of the closing to admission or to exhaust without changing the beginning of the opening.

2. A rotatory slide valve as claimed in Claim 1, further characterised in that the external body constituting the casing is made of two pieces, the rotatory valve cylinder being provided with a series of circular flanges, engaging and rotating in corresponding annular grooves provided in the wall of these two pieces, for the purpose of ensuring an improved gas tightness between the admission and exhaust passages and along the said valve cylinder, in the valve casing.

3. A valve as claimed in Claim 1, further characterised in that the central body can be displaced angularly at will while the motor is working, the displacement being controlled from a distance by the operator of the machine driven by the engine.

4. A valve as claimed in Claims 1 and 3, further characterised in that the angular displacements of the central body during the working of the engine are controlled by a regulator affected by the speed of the engine, means being provided to combine this automatic control with the said manual control.

5. A valve as claimed in Claims 1 to 4, further characterised in that the edges of the exhaust passages of the central movable body are turned back or bevelled in a direction transverse to the said body so as to extend the duration of opening to exhaust and to allow thereby to advance the closing to admission without advancing objectionably that to exhaust.

6. A valve as claimed in Claims 1 to 5, characterised in that at the end at which the control of the valve cylinder is affected, the central body is provided with a cylindrical bearing surface in a wider portion of the fixed external body, and with a collar fitting endwise under the pressure of a resilient member, against the machined surface of the said fixed body, the said collar having circular concentric slots adapted to admit bolts secured in the fixed body, the nuts of these bolts exerting a resilient pressure which causes a tightening of the collar against the fixed body.

7. A valve as claimed in Claims 1 to 6, further characterised in that the collar of the movable central body is provided with a toothed sector with which gears a second sector pivoted on the fixed body and adapted to be operated from a distance either by the operator of the engine of the vehicle propelled by this engine, or by means of an automatic regulator, affected by the speed of the said engine.

8. A valve as claimed in Claim 7, further characterised in that the second

sector is r[illegible]ed by a worm the position of the spindle of which is under the control of the said operator or driver.

9. The rotatory slide valve, substantially as described and as illustrated in the appended drawings.

Dated this 2nd [illegible] of August, 1927.

MEWBURN, ELLIS & Co.,
70—72, Chancery Lane, London,
W.C. 2,
Chartered Patent Agents.

Fig.1.

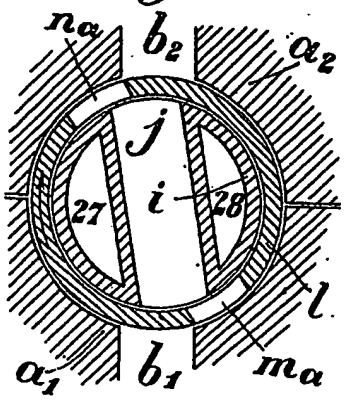


Fig.2.

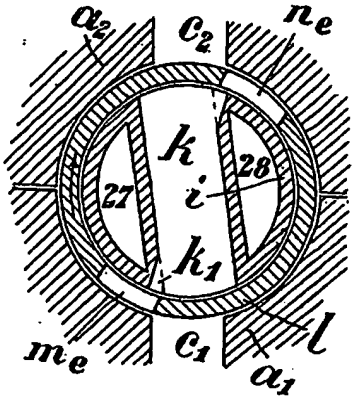


Fig.3.

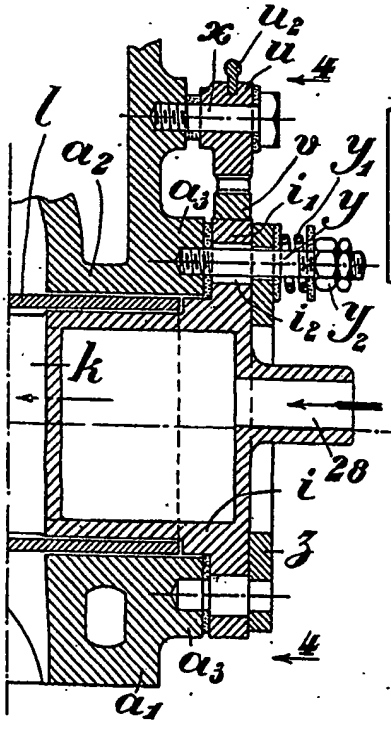
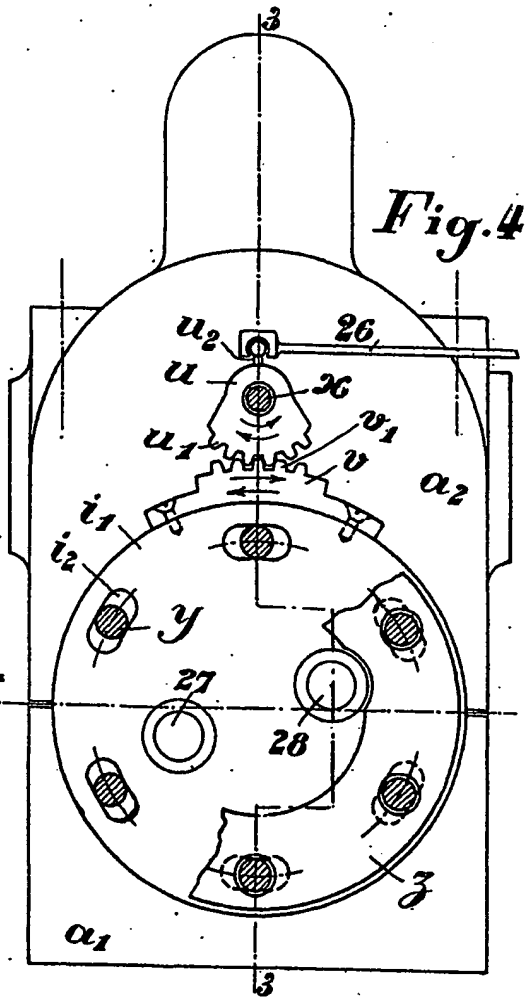


Fig.4



[This Drawing is a reproduction of the Original on a reduced scale.]

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